A GUIDE TO FARMING IN THE PRINCE GEORGE AREA

Province of British Columbia
Ministry of Agriculture and Food
VICTORIA, B.C.
1985

Canadian Cataloguing in Publication Data

Collins, J. A.
A guide to farming in the Prince George area

Co-ordinating author, J.A. Collins. Cf. p.
Bibliography: p.
ISBN 0-7726-0237-9

1. Agriculture - British Columbia - Prince George Region. I. British Columbia. Ministry of Agriculture and Food. II. Title.

S451.5.B7C65 1985 630'.9711'2 C85-092046-9

CONTENTS

Introduction.....1

Climate.....2

Land Clearing.....5

Soils.....9

Soil Management.....12

Crop Nutrient Requirements.....14

Field Crops.....18

Beef Production.....28

Dairy Farming.....31

Sheep and Lamb Production.....33

Horticulture.....34

Honey Production.....38

Services Provided by BCMAF.....39

Government Financial Assistance Programs..41

Farm Accounting.....42

Farm Financing and Credit.....43

Agriculture Credit Sources.....45

Income Tax Opportunities.....47

Acknowledgements.....48

Recommended Reading Material.....49

* *

INTRODUCTION

Economic activity in the Prince George area consists largely of forest related industries, although considerable industrial diversity is evident. Prince George acts as a transportation, distribution, trade, service and manufacturing nucleus for the central and northern portions of the province and is expected to continue to be important in this role. Population levels have shown steady increases, due in part to the expanding industry, particularly in forestry, and are expected to continue.

The total land used for agriculture is 64,000 hectares (158,000 acres), while 27,000 hectares (67,000 acres) is improved for crop production. If an assumed average gross income of $300 per improved hectare ($120 per acre) is used, this would represent a gross cash income of at least 8.2 million dollars. The improved land base has been expanding at the rate of about 800 hectares (1,980 acres) per year.

The major agricultural enterprises in the area are hay and beef production. Dairying also has an important role, supplying 65% of the local demand. Horticulture crops are also grown but not widely at this time.

Expansion of the various enterprises is possible and is discussed in detail in this publication.

This publication is intended to provide basic agriculture information for both beginning farmers and those who are expanding their land holdings. The material presented is intended to be specific to the area described as the Prince George Special Sales Area, although it is also applicable to much of the Central Interior. It is our desire that the information provided will give the reader an impetus to find more detailed information on those subjects that are of interest, and consequently improve the possibility of establishing a viable farm unit. The references mentioned and the recommended reading material are an indication of the long list of available information.

CLIMATE

The climate of the Prince George area can best be described as a mixture of weather patterns influenced by maritime weather from the Pacific Ocean and to a lesser extent by continental airstreams usually occurring during the winter months. This is caused by the physical barriers of the Rocky and Coastal Mountains, providing a moderate temperature all year.

Climatic Factors Affecting Crop Growth

Summer precipitation and higher temperatures begin with frequent thunder showers in June which continue to the middle of July. This often hinders the harvesting of forage as hay. Ranchers and farmers are solving this problem of untimely rain by harvesting their forage as silage. It should be mentioned however that the higher precipitation during June offers an opportunity for optimum crop production as it is concurrent with the longest day length of the growing season.

Snow usually limits access to tame or native forage from mid November until mid March. Field access is often limited by soft ground conditions created by high soil moisture content and breakup until late April. This is dependent on soil types (clay vs. silt) as well.

Land clearing can often be carried out during the dry periods from mid May until late October, but rain in June and July often reduces the time available. Late summer and early fall tend to be the best periods to avoid damage to and loss of topsoil. Early winter can also be a successful period for basic land clearing, such as stumping and piling, if soil moisture levels are moderate and frost has been penetrated too deeply. Excessive frost will not allow removal of the soil from the stumps after they have been removed from the ground. A thorough knowledge of historical weather patterns and a good source of information on future weather conditions is important for carrying out necessary farming operations.

The frost free period is the other climatic factor that determines crop suitability and productivity of the region. The frost free period is influenced by elevation and decreases as elevation increases. The last frost of spring and the first frost of fall are important to observe when very frost sensitive crops are to be considered while the killing frost both in the spring and fall are important for the more frost tolerant crops, such as forage and some cereal crops. Detailed information is presented in the following table.

TABLE I

LONG TERM AVERAGES 1941 - 1980 FOR PRINCE GEORGE AIRPORT

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	YEAR
MEAN DAILY MAX. TEMP. (^{o}C)	-7.2	-0.8	3.5	9.8	16.4	19.9	22.1	20.8	16.4	9.6	1.0	-3.7	9.0
MEAN DAILY MIN. TEMP. (^{o}C)	-16.4	-11.6	-7.7	-1.9	2.4	6.1	7.7	6.7	3.2	-0.3	-6.7	-11.6	-2.5
MEAN TOTAL PRECIPITATION (mm)	59.2	42.9	31.5	29.5	42.2	58.2	57.9	73.4	55.9	61.0	54.9	54.1	620.7
MEAN SNOWFALL (cm)	59.4	37.3	24.9	10.2	2.0	T	0.0	0.0	1.0	10.2	39.4	49.0	233.4
HOURS OF SUNSHINE	54	89	139	187	255	256	279	245	158	104	60	39	186.5

AVERAGE FROST-FREE PERIODS **

-2^{o}C		0^{o}C	
Last spring frost	First fall frost	Last spring frost	First fall frost
May 19	Sept. 15	June 14	Aug 25
Frost free period 119 days		Frost free period 72 days	

** -2^{o}C Killing frost for most frost tolerant crops

0^{o}C Killing frost for frost sensitive crops

(B.C. Ministry of Environment)

TABLE II

CLIMATIC SUMMARY, PRINCE GEORGE 1970 - 1984

MONTHLY PRECIPITATION (mm)

YEAR	MAY	JUNE	JULY	AUG	SEPT.
1970	79	15	73	47	56
1971	30	74	84	33	61
1972	5	108	95	44	29
1973	84	85	50	48	63
1974	65	42	97	24	46
1975	44	88	43	86	23
1976	78	122	81	69	41
1977	65	54	110	52	66
1978	44	37	38	63	52
1979	72	73	25	32	50
1980	66	84	83	106	85
1981	64	90	38	11	42
1982	56	15	131	89	133
1983	16.5	146	111	61	37
1984	99	67	42	71	81

LAND CLEARING

Dense forest growth and large sized trees make land clearing very expensive. The use of modern equipment has facilitated land clearing operations. Sometimes the ease and speed of such operations leads to the removal of trees from land unsuitable for farming. When clearing land, particular attention should be given to preserving the organic layer on the surface and preventing the exposure of too much subsoil. Often forest litter is burned and part of it is buried; the inactive subsoil is brought to the surface, causing a loss of fertility and deterioration of structure of the surface soil.

Clearing should only be done when the soil is sufficiently dry to avoid rutting, compacting, smearing and the loss of topsoil. Keep the following objectives in mind:

1) complete removal of all trees growth, except where windbreaks and watercourse protection are required;

2) removal of large roots and rocks which would interfere with land breaking and subsequent tillage operations;

3) soil-free brush piles to ensure complete burning with the least amount of labour and expense;

4) straight, well-packed windrows or round brush piles placed on a pre-cleared location;

5) no excessive loss of topsoil.

METHODS OF LAND CLEARING

Clearly mark the field prior to starting. If the land has been logged, the stumps have to be removed by splitting and pushing the stump out. Stumps should be left to dry and then piled and burned. Standing timber or brush is first knocked down or cut off at ground level and then piled and burned.

This type of land clearing can only be done where the tree growth is generally small (up to 10 inches) and is usually done in the winter when the ground is frozen and the brush is stiff. During the summer, more soil and duff is disturbed and it is harder on the cutting blade. For rough pasture purposes this may be an alternative in the short term to increase forage production on uncleared land.

Three methods of clearing land are described here.

Moldboard Plow

The moldboard plow is similar to a sod plow but of heavier design. It is generally used to cut and remove the stump and roots from the soil after the trees have been cut down. Once plowing is completed the land must be disced with a heavy disc, floated and root-raked.

Soils should not be plowed beyond 15 centimeters (6 inches), otherwise surface organic matter is buried and will not decompose under the cool climate; and low organic matter subsoils are brought to the surface resulting in soils which are prone to baking and crusting. Subsequent crop yields can easily be reduced by plowing too deep.

Breaking Disc

The breaking disc is similar to an off-set disc but is much stronger with blades up to 900 mm (36 inches) in diameter. It is usually used after the stumping or knocking down and piling procedures of clearing. It works and smoothes the soil, cutting small roots in preparation for floating and root raking. The disc is preferred as it tends to leave the organic matter at the surface providing for improved soil structure, water holding capacity and tilth. For pasture purposes this is often the last operation before seeding because all of the wood debris need not be removed.

Rotary Plow

The rotary plow is a large rotovator, but is drawn by a 200 kw (260 H.P.) tractor. The rotary plow can be used where the brush is small (2.5 - 3 cm) or the stumps are partially rotten. The machine is not recommended for clay soils due to the breakdown of the soil structure. The action of the machine pulverizes the soil which will cause baking, crusting and generally poor tilth in succeeding years.

Land Clearing and Development Costs - 1983

If you are considering a land clearing project you should be aware of all the costs and benefits involved. Farm managers must not only consider the costs of the project but the benefits, which include the increased productivity of the land and the increased value of the land. In todays economic climate, farmers must plan their investments very carefully, to ensure that scarce dollars are invested in the most profitable projects.

The budget (Table) provides a guide to land clearing costs in the Prince George area. It outlines cost estimates for two different situations, a natural site and a recently logged site. The budgets are intended to assist farmers in estimating the costs of developing land. It should be emphasized that land clearing costs vary greatly and that these estimated costs are particular to the type of sites described.

Management

Before initiating a land clearing project a farmer should ask himself some of the following questions. Is it economically feasible to develop the land at this time? What machinery complement will be required? Should I do the work myself, hire a contractor to do the job, or some combination of the two? Is contract equipment available? Can my cash flow handle the complete project or should it be done in stages over a period of time?

Operations

The operations outlined include all necessary operations to complete a thorough land clearing project. Cost of each operation is specific to: the line of equipment used; the time needed and number of operations; the soil type and topography of the site; the state of the site and the vegetation cover. Therefore the cost of each operation is stressed rather than the final cost per acre as calculated in the study. Care should be used in applying the data to your farm situation because of the difference in these factors associated with land clearing.

Costs

Cost per acre was calculated by multiplying contractor hourly rates by the time needed per acre to do each operation. In some situations, a farm manager may be able to negotiate a lower job price with a contractor due to surplus equipment availability or clearing a larger acreage.

References: Land Clearing in British Columbia, B.C. Ministry of Agriculture & Food, 1982

AVERAGE SITUATION (1)

Cost Per Acre

Operation	Recently Logged Site	Sub-Total (2)	Natural Site	Sub-Total 2
Equipment Hauling (3)	$ 18.60		$ 14.10	
Rooting, Grubbing, Piling	200.00		--	
Walking Down	--		50.00	
Piling		218.60	100.00	164.10
Burning and piling	120.70		120.70	
Disc Breaking or Plowing (4)	37.50		42.00	
First Harrowing, Floating	9.80		9.80	
First Root Raking	18.15	186.15	18.15	190.65
Third Repiling	20.00		---	
Fourth Burning	1.90		1.90	
Chisel Plowing	11.25		---	
Discing	---	33.15	23.10	25.00
Second Harrowing	9.80		9.80	
Second Root Raking	18.15		18.15	
Root Removal	10.60	38.55	10.60	38.55
Misc. Service Vehicle, Site Inspection		20.80		20.80
Farm Operator Management Value		5.00		5.00
Land Clearing Costs		505.25		444.10
Cost of Bush Land		300.00		300.00
Interest on Land @ 6%		18.00		18.00
Total Value of Developed Land		$820.25		$762.10

Footnotes:

(1) i) The recently logged site was mechanically harvested within the last 3 years.
ii) The natural site has no timber worth logging and is 75% poplar.
iii) Heavy and light tree cover can appear on either site. The size of the stumps and tree density can be more or less than average and costs would be adjusted proportionately.

(2) The land development can be done in stages over varying lengths of time. Partial jobs can be compared to sub-total figures.

(3) Equipment provided by the contractor would be, breaking disc, wheel root rake, 140 HP tractor, chisel plow or cultivator. The farmer owns and has on site: a pick-up truck, tractors with 100 HP, 60 HP & 30 HP, a wagon, a harrow and a float.

(4) Breaking procedures vary with the site.

Reference: C.D.C. #243 Land Clearing and Development - Prince George

SOILS

An understanding of the soil capability classification and soil type is important both for the knowledgeable selection of land for farming, and to determine the probable range of crops that can be grown. These factors will ultimately influence the potential income that can be derived from the land.

The soil capability classification for agriculture groups soils on the basis of climatic and soil data, and assigns the soils to seven (7) capability classes. Class 1 soils have few limitations to produce the widest range of regionally adapted crops. Class 4 soils have limited capability to produce annual crops. Class 5 soils are suited for perennial forage and improved pasture, while Class 6 soils are suitable for natural grazing. Class 7 soils are not suitable for agricultural production.

A summary of the 7 classes is presented below is as follows:

Class 1 - has no, or very slight limitations.
Class 2 - has only minor limitations.
Class 3 - has some limitations on range of crops and requires good ongoing management
Class 4 - range of crops is severely restricted and requires special management practices.
Class 5 - capable of producing only perennial forage crops.
Class 6 - non-arable but capable of producing tame forage crops for pasture.
Class 7 - no capability for agriculture except limited natural grazing.

Within each capability class, soils are rated as to the dominant limitations which placed them there. These limitations are called subclasses, and will give the user information about the limitations for agriculture of these soils.

The subclasses are:

C - Adverse climate
D - Undesirable soil structure and/or permeability
E - Erosion
F - Low fertility
M - Moisture limitations
P - Stoniness
R - Consolidated bedrock
T - Topography (slope)
W - Excess water
X - Cumulative minor adverse characteristics

The Prince George Special Sales area does not have class 1 soils due to climatic limitations. The soils of this area have been mapped and given specific names which include a description of the soil. The following is a short list of the predominant soils and their agricultural characteristics. A more detailed report is available from the BCMAF at Prince George.

1) Fine textured clay deposits. Examples: Pineview, Beaverly and Berman. These glacial lake clays have low organic matter levels and have an impervious subsoil. Spring snowmelt or extended rainy periods create saturated soil conditioning. It is important that when using deep tillage equipment this impervious, low fertile clay layer not be brought to the surface.

   The fine textured soils are cold (high moisture retention) resulting in slow organic matter decomposition rates. Tractor power requirements are relatively high for normal cultivations. Low evaportranspiration rates in the fall make access difficult for harvesting or fall cultivation. Therefore, the "available working days" (opportunity days) for field operations are limited.

   Crop nutrient levels are fair to good for most crops. Potassium (K) is generally well supplied while phosphorus (P) can vary depending on intensity of the farming operations. Nitrogen (N) is usually low and needs supplementation each year. Sulphur (S) levels are often low but can be built up with added sulphur fertilizers. However, care should be taken not to add any more than the crop requirements as excess sulphur can slowly reduce the pH levels. Monitoring of pH and nutrients by way of soil testing is recommended. The pH levels can be adjusted with the use of agricultural lime. Boron (B) is generally low and should be supplemented where legumes are to be a major proportion of the crop. Boron can be applied at 2-3 year intervals.

2) Medium textured soils. Examples: Fraser, McGregor and Bednesti silt loam. These soils were developed as a result of lake or river deposits and have a sandy loam to silty and clay loam texture. Except for the McGregor soil, they often have a clay layer at approximately 15-20 cm (6-8 in.) which can be quite hard when dry. These soils are deficient in Nitrogen and generally have a low organic matter content, although they are not prone to baking or crusting. Cultural practices can limit the undesirable aspects of the clay layer. These practices include varying the depth of various cultivation operations and the use of deep tillage chisel plows to partially break up this hardpan.

The McGregor soil series generally have adequate soil nutrients when initially cleared, but levels can diminish depending on the intensity of farming operations. The pH levels are above 6.0, allowing for production of those crops requiring neutral or slightly alkaline conditions. The remaining soils have a pH ranging from 5.8 to 6.0.

The remaining soils in this group have generally low nutrient levels for nitrogen, potassium, sulphur and boron. Phosphorus is generally well supplied but often needs to be supplemented. Because nutrients can be leached out of the surface soil, soil testing should be done regularly to ensure adequate nutrients are available for crop requirements.

Due to superior climate and/or structural conditions, all these soils have the ability to grow a wider range of crops than the clay soils. The McGregor soil series are able to grow vegetables and alfalfa and higher yields of grain crops. This makes these soils the prime agriculture soils of the area.

Reference: B.C. Soils Capability Map Sheets 93G and 93J, Ministry of Environment, Victoria, B.C.

SOIL MANAGEMENT

Tillage After Clearing

After the initial breaking of the land has been completed, the subsequent cultivation and cropping practices should be those that encourage the decomposition of natural organic matter for crop growth, but will also build up or at least maintain the organic matter content. These practices include the selection of appropriate tillage equipment, fertilizers and crops.

Deep tillage should be done but only by minimizing the amount of sub-soil clay to the surface. Sub-soil clays tend to bake and crust and are low in nutrients. Germination and establishment of crops are delayed by the presence of the sub-soil clay in the surface soil.

Preferred Crops After Clearing

After the initial preparation of the land, subsequent to clearing, it is recommended that cereal crops be grown with the application of high levels of nitrogen (70-80 kg nitrogen per hectare) and other nutrients as required for a maximum of 2 years. This encourages the breakdown of the woody materials left in the soil and provided sufficient nutrients for good crop growth. The subsequent crops should be grass-legume mixes either for pasture or stored feed production.

Should forage crops be grown after clearing, attention should be paid to fertility requirements, especially nitrogen and sulphur where it is predominantly a grass stand.

A) Sod Crops

The moldboard plow is the most efficient method, but it should be set up to ensure that the sod is fully turned into the furrow. This will reduce the tillage requirements for seed bed preparation and will prevent any unwanted grass regrowth. The use of a smooth roller will also help push the sod into the furrow and make a smooth field surface. The plowing depth should be approximately 5 to 7 inches on the silt soils and 4 to 6 inches on the clays depending on the depth of the topsoil and the amount of sod to be buried. The depth should be altered each time a field is plowed, to avoid the plow pan formation.

Sod renovation in permanent pastures must be treated similarly. Research work is being conducted to determine the most effective method for the Prince George area.

B) Annual Crops

If cultivation is required after an annual crop, the first objective is to ensure that the remaining debris be spread evenly over the ground. This is done by using straw choppers on the combine, or by using reciprocating harrows. Once the debris is spread,the soil can be either cultivated or disced. The use of chisel points on a deep tillage cultivator is popular. It can work 6 to 8 inches deep, which disrupts the plow pan layer. This is especially valuable on the silt soils (Bednesti) as it promotes root and water penetration. This implement can also be used on clay soils but power requirements are high. The results are not as effective as on the silt soils because the shattered soil horizon is quickly filled in again by the fine clay particles. The use of the disc should be minimal except as a primary tillage. It can cause excessive breakdown of the soil structure resulting in poor tilth, that is, powdering of soil and subsequent baking after a rainfall.

Rotary plows create a very find seedbed condition. While the immediate results look impressive, it is not suitable for clay soils of low organic matter status. Soil compaction is increased by a rotary plow under almost any soil moisture content. The total energy requirement per unit volume of soil disturbed is higher than other implements, but usually requires no follow-up operations.

SOIL AMENDMENT

A) Manure has traditionally been used to enhance soil productivity. It does this by increasing the organic matter and by supplying some of the essential nutrients. In order to use manure efficiently, it should be applied to the land in early fall or early spring, and be incorporated immediately.

B) Green Manuring - Legumes improve growing conditions for following crops by fixing nitrogen and by breaking up soil structure with their root mass. Grasses also help to improve soil structure but do not have as high a root mass, nor do they fix atmospheric nitrogen.

The optimum time for plowing down a legume crop is after a first hay cut, in middle to late summer. The complete plowdown of a hay crop has not been proven to be superior to taking the hay crop first, and hen plowing. By plowing in summer, nitrogen is released for the next crop. Plowing in late fall or early spring does not allow enough decomposition of organic matter for nitrogen release for the following crop. The decomposition of organic matter releases nitrogen to crops over the next two to three years and the total release is greater with legumes than with grasses.

CROP NUTRIENT REQUIREMENTS

Each crop has its own particular requirement for specific nutrients. Plants draw nourishment from three sources - air, water, and soil. From water, oxygen and hydrogen are obtained; from air, carbon and oxygen and for soil mainly all other elements. From the soil primary plant foods are nitrogen, phosphorus and potassium. These are also the ones most likely to be in short supply. There are secondary and micro elements that may also be deficient.

Soils vary as to the quality of nutrients available depending on past crop removal, soil erosion or leaching, etc. Whatever the cause of the low nutrient level, it must be supplemented to achieve optimum economic yields. These required nutrients can be supplemented by various methods including crop residues, livestock manure and chemical fertilizers. Often the best choice is a combination of the two nutrient sources.

A chemical analysis of the soil for both major and secondary and micro nutrient content, will be an excellent guide to optimize the fertilizer program best suited for the particular soil type to be farmed. The techniques for proper sampling of a field are available from the BCMAF. Soil sampling and testing should be done on a regular basis, as the levels of nutrient content change over time.

The following are the elements that are most limiting in this area.

Nitrogen

Acute nitrogen deficiency symptoms are pale color and poor growth. It can be supplemented by using a variety of fertilizers including urea (46-0-0), ammonium nitrate (34-0-0), ammonium sulfate (21-0-0-24), or urea sul (34-0-0-11). The ammonium or nitrate forms of nitrogen are the most suitable for top dressing forage crops. Urea is satisfactory if it is to be incorporated into the soil.

Phosphorus

Adequate levels of phosphorus will encourage longevity and aid in maintaining forage legume quality. In grain crops, adequate levels will enhance growth, seed yields and will promote crop maturity. In grains, phosphorus is most efficiently used when placed near the seed. In perennial forage crops it is necessary to apply this nutrient at the time of seeding because placing it on top of the soil surface does not allow adequate uptake by the roots. Banding of phosphorus has proven to be the most efficient method of application. There are various fertilizer mixes with phosphorus; these include ammonium phosphate 11-51-0, 13-16-10 and 16-20-0.

Sulphur

Sulphur deficiencies can occur and the requirement to provide adequate amounts is not large. Often an interaction effect between nitrogen and sulphur occur, resulting in a yield much larger than either of the nutrients can provide alone. Sulfur is best applied in sulfur containing fertilizers rather than elemental forms because these require bacterial action to make the sulphur available to plants. Response to elemental sulphur may not occur for up to two or three years after application.

Common sulphur containing fertilizers are:
34-0-0-(11s), 16-20-0-(15s), 21-0-0-(24s), 13-16-10-(12s), 10-30-10-(4s), 26-13-0-(3s), 8-24-24-(3s).

Boron

Crops such as alfalfa, beets, cauliflower and rutabagas respond to applications of boron in many areas. It is recommended that annual applications be made in vegetable crops and every 3 or 4 years in forage crops, especially those that have a high percentage of legumes.

Other Elements

Magnesium, manganese, copper and zinc deficiencies have been found in this area. Testing for these minor elements will assist in identifying any potential problems.

A PARTIAL LIST OF FERTILIZER MATERIAL AVAILABLE

Ammonium phosphate	11-55-0	Ammonium sulfate	21-0-0-(24)
	11-51-0		
	11-48-0	Ammonium nitrate	34-0-0
Ammonium phosphate sulphate	16-20-0-(14)	Urea-ammonium sulphate	34-0-0-(11)
Ammonium nitrate phosphate	23-23-0	Urea	46-0-0
	27-14-0	Potassium chloride	0-0-62
Urea ammonium phosphate	27-27-0		
	27-26-0		
	34-16-0		

Ammonium nitrate phosphate sulfate 26-13-0-(3)

There are many formulations possible (by mixing compatible chemicals together) which are not listed. The percentages as listed must be shown by the manufacturer by law. The figures 11-48-0 indicate that the fertilizer contains 11 percent nitrogen, 48 percent phosphate and no potash or sulphur. These figures do not add up to 100 percent because the nitrogen and phosphorus are combined with other elements not included in the analysis.

SOIL ACIDITY AND LIMING

Definition of an Acid Soil

Soil acidity is measured by the degree of soil reaction, or pH. The reaction is alkaline when the pH is above 7.0; is neutral at pH 7.0; and is acid when below pH 7.0. Soils with pH values of 6.5 - 7.5 are considered, for practical reasons, to be neutral. Soils with values of 5.6 to 6.0 are moderately acid, and strongly acid when in the 5.0 to 5.5 range. Soil tests are the only reliable method to determine the pH value.

Reasons for Acid Soil

Soil acidity is caused by acidic geological deposits, or soil forming processes that have caused the upper soil layers to become acidic. Pure rain water is slightly acidic and as it passes through the forested soils it causes the soil to eventually become acidic.

Soil pH Values

The Pineview and Bednesti soils have pH values ranging from 5.3 to 6.0. River benchland soils have pH values ranging from 5.6 to 6.3.

Effect of Soil Acidity on Crop Growth

- Soil acidity has a direct effect on the survival and growth of the rhizobium bacteria which fix atmospheric nitrogen and leguminous roots. The rhizobium that grow in association with alfalfa and sweet clover are very sensitive to soil acidity.

- High aluminum and manganese levels can become toxic when associated with low soil pH values, causing poor root growth.

- The availability of phosphorus to crops is partially controlled by the level of soil acidity. Liming will increase the utilization of phosphorus to crops.

- Liming will enhance the decomposition of organic matter increasing the availability of other nutrients such as nitrogen.

- Lime applications also improve the physical structure reducing crusting and power requirements for tillage.

Acid Soil Management

The first step is to determine the pH of the soil and see if liming will actually enhance growth or allow a greater range of crops to be grown. For example, the Pineview soils are acidic but even with the addition of lime, alfalfa is not likely to be grown successfully. However, alternate forage crops such as red and alsike clover produce quite well on these low pH soils. Therefore, although the use of lime will adjust the pH, there may also be no economic benefit. Consultation with soil and crop specialists will help to determine the need for lime for various crops and soil types. Applications of nitrogen and sulphur fertilizers has been implied to add to the acidity problems of the soil. Producers should apply these fertilizers for economic yield rather than worry about soil acidity or micronutrient considerations.

FIELD CROPS

The Prince George area is generally best suited to the production of forage crops although cereals, canola, forage seed and horticulture crops can be grown on some soils with favorable climate.

FORAGE

Forage is a general term used to describe a wide variety of grasses and legumes and cereals utilized as hay, silage or pasture. It is grown for on farm consumption by livestock or for local hay sales to the livestock industry.

The production of forage crops can be thought of as a series of steps which converts sunlight and soil nutrients to forage. The five steps in the production of forage are:

Step 1: Select forage varieties for the intended use with a view to yield, protein content and digestibility.

Step 2: Develop and maintain an optimal forage stand through proper seeding, fertilization and dates of harvesting.

Step 3: Harvest the forage crop at the optimum stage with minimum loss.

Step 4: Store the crop with minimal loss.

Step 5: Provide an optimum environment for the livestock to convert forage into meat.

The following discussion provides more detail on the first four steps to efficient livestock production.

STEP 1

Forage Crop Selection

A) LEGUMES, including alfalfa, clover, peas, beans and vetches have been so named from the fact that the seeds are borne in pods consisting of one or more seeds. Legumes are important for having nodules on the smaller roots caused by nitrogen fixing bacteria. These bacteria have the ability to convert nitrogen from the atmosphere to a form readily used by the plant. Alsike clover fixes the most nitrogen in the Prince George area with up to 110 kg of N per hectare being produced.

Alfalfa and clover are especially important to the livestock industry because they have higher protein and energy content than most grasses. Recommended varieties have been tested at Prince George to provide optimum yields and longevity.

The following is a brief description of each of the legume species adapted to the Prince George area.

Red Clover

Red clover is best adapted where summer temperatures are moderately cool to warm and where adequate moisture is available throughout the growing season. It is tolerant of acid soils (pH 5.0 - 6.0) but will have reduced yields below pH 5.0. It is not as well adapted to low, poorly drained soils as alsike clover. In short term rotation of 2 to 3 years, red clover is useful forage crop when seeded alone or in a mixture with bromegrass and timothy or orchardgrass. Red clover should be harvested at an early bloom stage for optimum quality and to allow for regrowth. The single cut variety, Altaswede, is very productive. Double cut varieties are not recommended because of their lack of hardiness.

Alsike Clover

Alsike clover, although lower yielding than alfalfa and red clover, produces the highest quality forage. This perennial forage is adapted to cool climates and to moist-to-wet soils. It will not survive summer drought conditions. Alsike clover may survive flooding for periods up to 6 weeks and on soils too acid for red clover. Alsike clover has been implicated in poisoning of horses in either hay or pasture. Symptoms include cirrhosis of the liver, photo-sensitization or allergy reactions. Poisoning only occurs in approximately one out of ten horses but as a consequence, alsike is not recommended for horse consumption.

Alfalfa

Alfalfa use is limited in the Prince George area to lighter structured soils with a pH of 6.0 or higher. The plant requires well drained soils and does not tolerate a water-logged surface for more than two weeks. However, where alfalfa is adapted, it is one of the highest yielding forage crops in the area. There is also a ready market for good quality alfalfa hay for the livestock industry.

OTHER LEGUMES

Birdsfoot trefoil - Birdsfoot trefoil is the only bloat-free legume adapted to this area. Its prostrate type growth and August regrowth make it valuable for pasture but it is only adapted to good moisture conditions. It cannot stand competition so should only be planted with non-creeping grasses such as timothy.

Sweet Clover - A true biennial which dies in its second year of growth. Its use is limited in this area due to its requirements of pH 6.0 or higher.

White Clover - Low growing white clover is used in horse pasture mixtures. Tall growing (ladino types) are not hardy in this area.

Peas - Peas are sometimes planted in combination with oats or barley to increase the protein content of cereal silage.

Innoculation of Legumes

It is now recognized that innoculation of all legume seeds with an appropriate strain of rhizobium bacteria just prior to seeding is required to promote the rapid establishment and healthy growth of the legume. A high percentage of the total seasonal nitrogen demand can be supplied through good nodulation. There are certain strains of bacteria that are specific in their compatability with certain legumes.

The grouping is as follows:

1) The alfalfa group for both alfalfa and sweet clover.
2) The clover group suitable for red clover, alsike clover and white clover.
3) The pea group which would be applied to garden and field peas and many vetches.
4) The bean group.

Specific innoculation must be used on birdsfoot trefoil, sainfoin, cicer milkvetch and lentils. Recommendations on innoculants and procedures are available from the BCMAF.

B) GRASSES are narrow-leafed plants with fibrous root systems. They do not fix nitrogen but are generally higher in yield than legumes in the Prince George area.

The predominate species grown are timothy, smooth bromegrass, orchardgrass and reed canarygrass with lesser use of wheatgrasses.

Timothy

Timothy is the hardiest grass for this area with good yields. It is palatable as pasture or hay but requires sufficient moisture to maintain growth. Timothy requires good levels of nitrogen for optimum yields. Recent variety development allows one to select for early or medium maturing mixtures or for pasture or hay types.

Smooth Bromegrass

Bromegrass is a sod-forming perennial adapted to most soil types. It is reasonably tolerant to drought conditions but will not tolerate as much flooding as Timothy.

Smooth bromegrass will only provide August regrowth under good moisture conditions.

Orchardgrass

The hardy variety Kay has brought the high-quality feed of orchardgrass to this area. Orchardgrass is a long-lived perennial bunchgrass, especially on the lighter textured soil where it can be protected from winter injury. It will not tolerate extreme icing, lack of snow-cover, or flooding situations and prefers well-drained, fertile soils. It provides excellent spring, summer and fall pasture where it is adapted.

Reed Canarygrass

Reed canarygrass is a tall, course perennial with a moderate creeping habit and is equally adapted to wet and dryland conditions. It is the most tolerant cultivated grass to long term (up to 6 weeks) flooding. Forage quality, especially energy content, drops rapidly after the grass reaches the boot stage.

Intermediate Wheatgrass

Intermediate wheatgrass is a short-lived perennial with moderate creeping habit. It is very high yielding and is one of the fastest drying grasses for hay. It is well suited to alfalfa or red clover mixtures because of its late maturity and weak competition.

Meadow Bromegrass

Meadow bromegrass is an early pasture grass with more regrowth than smooth bromegrass but with less total yield. It has less fall growth than orchardgrass. It is slower to establish and is less tolerant to spring flooding than smooth bromegrass.

SUMMARY OF GRASSES AND LEGUMES

Dry matter production of either grasses alone or in grass-legume mixture varies considerably depending on soil type, use as hay, silage or pasture, or class of livestock. Legumes are not generally planted in pure stand because of the high moisture content making curing difficult. Low carbohydrate content also makes it difficult to make silage from pure legume stands.

The varieties that are recommended are those that have proven to be adapted to the region, including such features as winter hardiness, drought resistance and optimum yield. Refer to the pamphlet, "Forage Crop Recommendations for Central B.C." for more detailed information.

CEREALS FOR FORAGE

Considerable research has been carried out in the Prince George region to determine the best mixture of cereals and suitable varieties to be grown for silage. Yields of up to 10 tonnes per hectare (4.5 tons per acre) have been obtained from oats and/or barley planted at 112 kg/ha (100 lbs. per acre) in pure stand. Early maturing varieties can be used as a cover crop at 65 kg/ha (58 lbs. per acre) if soil moisture is plentiful. Silage crops should be harvested at the soft dough stage when yield and energy content are at their peak.

Strong-strawed barley varieties such as Diamond, Klondike, and Argyle with high grain content provide the best silage material.

Oats and fall rye are the best cereals for pasture.

Current recommendations for varieties and fertilizer practices are available from your District Agriculturist.

PASTURE

Pasture is the most economical form of feed in this area. The average daily gains for yearling steers is approximately 0.8 kg. (1.75 lbs.) to 0.9 kg. (2.0 lbs.) per day yielding 90 kg. (200 lbs.) of gain over 110 days of grazing. However, research at the Prince George Experimental Farm has shown that over a 111-day grazing period, production of 534 kg/ha (601 lbs. per acre) of beef on timothy alone can be achieved. These results were obtained utilizing rotation of pastures and fertilizers.

Recommended pasture mixtures include adapted varieties with equal or better forage quality to timothy. The mixtures are:

a) For clay soils of good moisture conditions or pH less than 6.0

Mixture	Seeding Rate kg/ha	lbs/acre
Kay orchardgrass	4.5	4
Manchar bromegrass	3.4	3
Salvo or Toro timothy	2.25	2
Aurora or Tetra alsike clover	2.25	2

b) For dryland or light soils or pH greater than 6.0

Kay orchardgrass	5.5	5
Manchar bromegrass	4.5	4
Peace, Rambler, Spreador 2 alfalfa	2.25	2

The legume component should be less than 25% by weight to reduce the risk of bloat. The species used will depend on soils and livestock utilizing the pasture.

The most gain is realized by rotationally grazing pastures once every 3 - 4 weeks, depending on grass growth. Clipping and good fertilizer rates help to keep pastures productive.

Grazing is often available on private land or on community pastures, usually based on a price per head per month. Contact the District Agriculturist for further information on pasture availability.

Native range is limited due to a heavy canopy of the natural coniferous forest. Permits may be obtained from Range division of the B.C. Ministry of Forests.

STEP 2

DEVELOP AND MAINTAIN AN OPTIMAL FORAGE STAND THROUGH PROPER SEEDING AND FERTILIZATION AND DATES OF HARVESTING

The longevity of a well established grass legume mixture will be dependent upon the hardy varieties, soil nutrient levels and grazing and harvesting practices.

Use a soil test to evaluate your legume requirements for phosphorus, potassium, sulphur and boron. Avoid spring grazing so that the legumes get off to a good start. Allow legumes to rest and store carbohydrates during the period August 1 to September 15. While animals can use the forage for good gains during this period, grazing will definitely shorten the pasture life of the stand.

Retain at least a four inch stubble to catch snow and prevent ice sheeting. Keep animals off the fields over winter to avoid legume crown damage. Remember that legume survival is crucial to good forage quality! Maintaining relatively young stands (up to four to six years old) will also keep quality high. Studies have shown that crude protein content of grasses drops with age of stand and that older legumes are more susceptible to winterkill. This points out the necessity for rejuvenating the stand when legumes are eliminated.

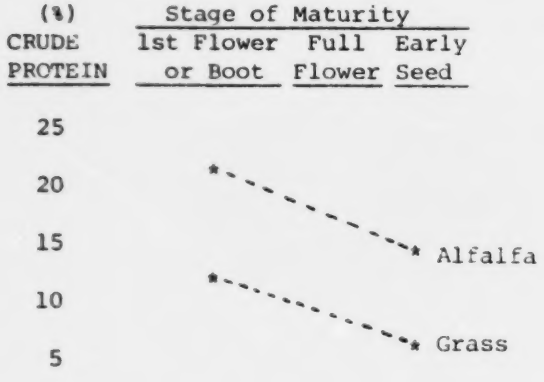
STEP 3

HARVESTING THE FORAGE CROP AT THE OPTIMUM STAGE

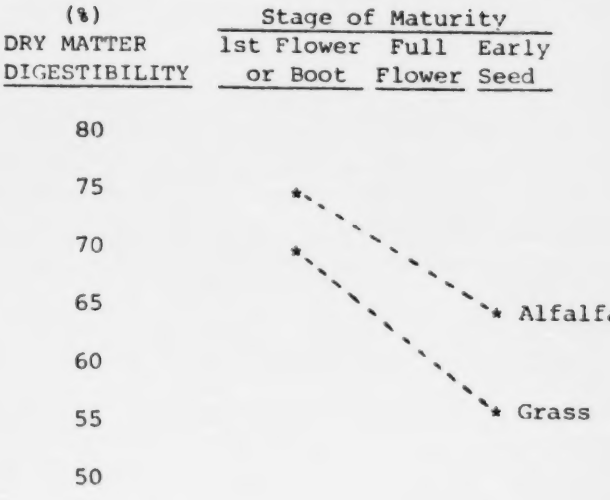
The justification for silage systems is often that forage can consistently be harvested at the stage of maturity with the highest yield/quality trade-off.

There are marked differences between grasses and legumes in crude protein and digestibility levels due to advancing maturity.

Effect of Forage Maturity on Crude Protein Level



Effect of Forage Maturity on Digestibility



Crude Protein and Dry Matter Digestibility

The drop in digestibility (energy) in grasses from the boot stage to early seed stage is certainly critical for efficient beef production.

The optimum stage to harvest for quality is bud to ten per cent bloom stage for legumes and the boot to early heading stage for the grasses.

The use of early and late maturing forage specifies and varieties allows one to spread the harvest season.

Early maturing high quality species include alsike clover, early alfalfa varieties, orchardgrass, bromegrass and early maturing timothy.

Later maturing varieties include Altaswede red clover, late-flowering alfalfas, Bounty timothy and intermediate wheatgrass. These would be expected to retain their quality longer in the season.

Weather conditions often prevent farmers from cutting hay at the proper stage of maturity and rains that come between cutting and harvesting cause significant loss in feed value and as a result hay quality is highly variable. Some farmers are now switching to silage as the preferred method of harvesting. Some of the most important reasons are:

1) The possitility of putting up high quality feed in spite of less than ideal weather.

2) The reduction of harvesting losses which normally result from weathering and handling of dry hay.

3) The ability to completely mechanize harvesting and feeding.

However, capital investment is condiderably higher and must be reviewed carefully.

Refer to the bulletin, "Silage in B.C." for more detailed information.

STEP 4

STORE THE CROPS WITH MINIMAL LOSS

The harvesting methods available are highly variable in the percent of loss of dry matter from the day of harvest to the day of feeding. Research has shown the approximate dry matter losses (%) under good management for various forage harvesting systems. The following table illustrates this point.

	HARVESTING METHOD			
Type of loss	Silage (bunker) (65% moisture content)	Round Bales	Loose Bales	Square Bales Under Cover
Harvesting loss	4%	9%	9%	10%
Respiration & weathering loss	2%	5%	10%	3%
Storage loss	15%	6%	10%	3%
	21%	20%	29%	16%

These losses can easily be higher if hay is stored without protection or if silage is not adequately packed or covered or if any of the hay systems used have moisture content greater than 15 - 17%. (For more information refer to the BCMAF Beef Manual or Hay and Harvesting Methods - O.H. Friesen, University of Manitoba.)

Hay Sales

An alternate use to stored feed is hay sales (square or round bales) to the local livestock industry. There is a considerable local market but the hay should be dust and alsike clover free if it is to be sold to horse owners. A feed analysis prior to purchase is recommended.

GRAIN AND OILSEED CROPS

Grain

Most cereal crops are not well adapted to the area but the earliest varieties of oats (Athabasca) and barley (Otal, Jackson and Gateway 63) can be grown with moderate success. Late maturing crops may never reach maturity due to low temperatures in August and September. Medium maturing barley varieties will offer higher yields if they can be harvested in your area.

Marketing options include local feed sales or on-farm use.

Canola

Canola (rapeseed) is an oil seed crop that is adaptable, to a limited extent, to the Prince George area. The income potential is good, but it is a crop which requires better than average management. Canola requires at least 90 kg/ha (80 lbs/acre) of nitrogen and moderate levels of phosphorus, sulphur, boron, and a rotation system that minimizes diseases. It also requires a good insect and broadleaf weed control program.

The market for canola includes a crushing plant at Sexsmith, Alberta and various companies in Alberta and B.C.

Grass Seed Production

Seed production was substantially greater during the 1930 to 1940 period than what it is today. Timothy and alsike clover seed were produced but ox-eye daisy seed contamination and the variable legume seed set due to the climate and poor pollination were obstacles to continued production.

While there is little promise for clover seed production, research has shown some promise for early maturing grasses. The B.C. Seed Crop Evaluation Project at Engen has shown that timothy, bromegrass, creeping red fescue and early maturing wheatgrass can be successfully grown. A grower is advised to secure a market before starting a forage seed enterprise.

Further information on production requirements, certification and markets can be obtained from the BCMAF office in Prince George. Other references include the final report of the B.C. Seed Crop Evaluation Project and the BCMAF report "A Preliminary Look at Market Opportunities for Wheatgrass Seed Production in Central B.C."

Reference: B.C. Seed Crop Evaluation Project Report (1984)

BEEF PRODUCTION

Beef has been the largest single agriculture endeavour in the Central Interior and it is anticipated that this will continue. The area is suitable for good yields of forage crops and beef provides one of the options for the marketing of that forage.

Beef raising can be categorized into various production systems including seedstock production (purebreed producers), commercial cow-calf or cow-yearling, backgrounding, and feeders. All of these options are carried out in this region but the cow-calf operation is predominant. Each system will be discussed in more detail later in this section.

Beef cattle can be marketed at a number of locations outside of the district; these include Vanderhoof, Williams Lake, Dawson Creek, Kamloops and the Edmonton, Alberta area. There is no regular auction market in the Prince George area catering to livestock sales. Buyers will come to the farm for direct buying if the volume is sufficient.

Cow-Calf and Cow-Yearling

In the cow-calf and cow-yearling operation the breeds most prevalent are those based upon the standard beef breeds of Hereford, Angus, and Shorthorn. However, during the past decade there has been considerable cross breeding utilizing other European breeds such as Charolais and Simmental. Breeding herds are being selected to provide an optimum of productivity factors, including environmental adaptation (cold tolerance, ability to forage on rough terrain), milking ability, and rapid growth.

Some breeds have an ability to excel in certain attributes, but may be weak in others. Selection of a breeding herd is a management decision based upon the needs and limitations that must be dealt with.

The initial purchase of the base cow herd will be one of the most important long term decisions faced by the farm manager. The cow herd must be the most efficient under his particular management and environmental conditions. They must wean a heavy calf each year, have a long productive life span, and a good mothering ability. Good livestock records are absolutely necessary in order to maintain this objective. Purchasing breeding stock from a production sale, private treaty, consignment sale, or dispersal sale will allow for an informed purchase; especially when production records are available. Breeders who remain in business do not usually sell their best animals, also, the "top end" of one breeder's herd may be equal to another breeder's herd average. The purchaser must have this information available to make an informed decision.

Housing requirements are generally minimal for beef. Each farm situation is different and therefore the basic requirements of space, shelter, feed, water, and waste management must be adapted to the conditions available on the farm site and to the level of intensity of operations contemplated. The farm plan should always allow for changes in size and management requirements to avoid unnecessary costs in the future. Changes might include earlier calving, feeding of silage, semi-confinement rearing, etc.

Backgrounding

This term applies to an operation that buys calves or yearlings and prepares them for further finishing at a finishing feedlot. It is a variable enterprise for this area but generally requires improved feeding and wintering facilities, good quality forage, some concentrates and a good knowledge of markets and market prices. This enterprise can often show improved net income over the cow/calf operation, but the potential for significant loss is also greater if the market prices are substantially lower than the initial purchase price.

Feedlot or Finishing of Beef Cattle

This beef enterprise has not gained widespread acceptance due to a number of factors.

The beef finishing business relies on feeding a grain ration as it is still the most economical. Grain must generally be purchased and transported to the area from the B.C. Peace River area, the Vanderhoof area, or from Alberta. The additional cost of handling and transporting grain adds additional production costs not to be experienced by the Alberta feedlot operator. The Prince George area is also without any federally inspected slaughter facility, leaving the market for finished beef either at Vancouver or Central Alberta.

Summer Grazing

(See Field Crops - Pasture Section for futher details) Native range is not generally abundant in this area due to an unusually heavy canopy of the natural coniferous forest. There are a few areas where reasonable grazing is available, but it is not a general feature of the area. As a consequence, improved areas of Crown Land have been developed at four locations to provide increased availability of summer grazing. These areas have been called "Community Pastures" and include the W.M., Giscome, Buckhorn and Whites Landing pastures. Availability will depend on demand by the farm industry.

Budgets

The following summary of a case study outlines some of the financial aspects of a cow/calf operation in the Central Interior of B.C. Even though these figures are not derived from actual farm records, the attempt has been made to be as realistic as possible.

RANCH BUDGET

Financial structure and budget for 150 cow/calf ranch.

CAPITAL REQUIREMENTS

land and buildings	$220,800	
machinery & equipment	113,900	
livestock	131,400	$466,100

INCOME

calves	44,300	
culls	12,600	$56,900

EXPENSES

production	35,800	
fixed cash	13,500	49,300

MARGIN $7,600

To cover: depreciation, interest on term loans, operator labour, return to owner's equity, and a reserve for growth and development.

The detailed case study is available from the District Agriculturist in Prince George.

DAIRY FARMING

Dairy farming has been well established in the Prince George area for many years. Over the past fifteen years a consolidation of operations has occurred, leaving only five viable farm units. The industry has gone through a considerable number of technological changes - from the type of livestock housing to the handling of milk - but it is now considered one of the most viable agriculture endeavours. The potential for increased fluid milk production is good if more of the local market share could be obtained.

The two Prince George processors receive over 2 million litres of milk per year, which represents approximately 65% of the total area consumption. There are five producers in the Prince George area (a total of twenty-four including the Robson Valley, Quesnel and Vanderhoof) who deliver to the processors, who in turn sell most of the milk to retail outlets.

The production of milk is controlled by the B.C. Milk Marketing Board which allocates quota to producers in B.C. There is a method of acquiring production quota through a system called a "building program", which is carried out over a five year period. Quota can also be purchased directly from existing producers.

The B.C. Ministry of Agriculture and Food provides both an information service and an inspection for quality on a regular basis. In addition, BCMAF provides licensing of milk producers, and inspection of processors equipment and facilities.

DAIRY BUDGET

Financial structure and budget for a 60 cow dairy farm.

CAPITAL REQUIREMENTS

land	$100,000	
buildings	126,000	
livestock	101,700	
machinery & equipment	253,000	
quota	270,000	
Total Assets		$850,700

INCOME

milk	$141,000	
livestock sales	13,800	
		$154,800

EXPENSES

production - livestock	$ 46,200	
- crops	23,700	
fixed cash	24,300	
		$ 94,200

MARGIN $60,600

To cover: depreciation, interest on term loans, operator labour, return to owner's equity, and reserve for growth and development.

The detailed case study is available from the District Agriculturist in Prince George.

SHEEP AND LAMB PRODUCTION

The B.C. sheep industry reached a peak in 1930 with approximately 145,000 sheep and lambs, but has since declined to 61,000 in 1982; supplying only 22.5% of the total market of 150,000 lambs required.

The location of the sheep production has shifted from the interior and northern regions of the Province to the south coast, raised primarily by small part-time producers. The major impediment to production has been low financial returns. The south coast area has maintained some production due to close proximity to ethnic groups preferring lamb and mutton, and to the local abattoirs.

In the Prince George area there are other impediments to increasing local production. These include predators and distance both to market and to Federally inspected abattoirs. There may be some economic benefits to raising sheep in the Prince George area; these include cheaper feed and other production costs. In providing the needs for the local market the raising of lambs under total confinement rearing offers some potential. For further information on this subject some suggested references are: B.C. Sheep & Lamb Marketing Opportunities Study 1983, and, Confinement Rearing of Lambs & Alberta Sheepman's Manual.

HORTICULTURE

Soils

A wide range of horticulture crops from vegetable and berries to ornamentals can be grown in the Prince George region depending on soil type and local climate. The land area best suited for commercial horticulture crops are on terraces adjacent to the Nechako and Fraser Rivers and bottom land of the Chilako and Salmon River valleys. Cool season crops such as broccoli, early cabbage, cauliflower and potatoes have been grown successfully on Bednesti silt loam to sandy loam soils in upland areas adjacent to the Nechako River.

Greenhouse operations do well on an upland area because of less fog and consequently more hours of sunlight. High elevations over 800 meters (2600 feet) or soils of clay or silty clay textures are generally unsuitable for field horticultural crops. A summary of frost free and killing frost free periods for Prince George is presented in Table 1. Page 2.

Marketing

Marketing a good product for a reasonable price is the key to a successful horticultural operation. There are at least three important goals to strive for when establishing a market outlet for a product. These are:

1. Grow a good quality product

2. Have a consistent supply of the product when in season.

3. Maintain good communication with sales outlets, selling agencies and fellow producers.

The local markets for cabbage, carrots, and rutabaga are presently fairly well supplied. Good storage facilities greatly expand the market of these products. Supplies of local lettuce, broccoli, cauliflower and potatoes are scarce and markets of these could be investigated as alternate crops. An over supply of a product inevitably results in a lower price.

Certain vegetables come under control of the B.C. Vegetable Marketing Commission namely; beets, carrots, cabbage, cauliflower, onions, parsnips, potatoes (table), rutabaga, greenhouse cucumbers and tomatoes. The B.C. Vegetable Marketing Commission controls the sale of these products on Vancouver Island, the Lower Mainland and the Interior up to the 53rd parallel just north of Quesnel. The vegetable growers above the 53rd parallel have to request to be exempt from marketing controls each year. They are allowed to sell their product anywhere except in the controlled market area. To sell their product in the regulated area, permission would have to be obtained from the B.C. Vegetable Marketing Commission.

The sale of berries or any other horticultural crops with the exception of commercially grown mushrooms do not come under any special marketing controls.

Horticultural Production

Vegetables - crops such as beets, broccoli, cauliflower, cabbage, carrots, rutabagas and to a lesser extent lettuce and potatoes have been grown with considerable success provided soil texture and management inputs were ideal for plant growth. Although lettuce and cole crops can be grown on clay soils, wet conditions make seeding or transplanting and harvesting very difficult or impossible in some years. The sandy loam soils are preferred, as they are with all root crops, including pototoes. In the Prince George region, transplanting is the preferred method of growing cole crops because of the short growing season and the weed problems associated with continuously growing cole crops. Precision seeding of cabbage has been successful in some warm locations while beets, carrots, lettuce and rutabagas are generally precision seeded.

Potatoes can be grown either for human consumption or for seed. Although production methods are similar for seed potatoes, a permit and several field inspections by the Plant Protection Division of Agriculture Canada are required before the grower can qualify as a certified seed potato producer. Marketing is a very important aspect of seed potato production. The market is generally a significant distance from Prince George, therefore personal contact will need to be made with prospective buyers of seed before production is considered. Establishing a reputation as a quality seed potato grower then is another requirement for success.

Local markets and good management techniques to keep the cost of labour and supplies at a minimum is the key to a successful vegetable and potato or greenhouse operation. The northern climate makes storage of vegetables or production of greenhouse cucumbers or tomatoes more costly than in the southern interior or coastal regions.

The climate in the central region is so variable that some supplementary irrigation equipment is required for most vegetable operations.

Berries - Berry production (strawberries, raspberries) has been limited to on-farm sale operation including "U-pick" and are expected to remain so. Good soil drainage and air drainage (to avoid frost pockets) are essential. Loam soils with supplementary irrigation are essential for successful production. Closeness to large urban centres is important when marketing a perishable product.

Nursery Crops - The ease and convenience of growing and bringing in ornamental nursery stock from the south coastal region does not make it economically feasible to propagate nursery stock locally. Much of the material is brought in and planted or heeled in for later resale. However, an awareness in the importance of landscaping is slowly increasing, resulting in an increased demand for nursery stock.

Although bedding plant material continues to come into the Prince George region from the south, local growers are increasing their share of the market by having a readily available, high quality product. As with vegetables, any expansion in bedding plant operations should be tied in with a thorough investigation of all available markets with the view of replacing material coming from outside Prince George.

Greenhouses - Greenhouse cucumbers and tomatoes have been grown successfully on a small scale for several years. Some modernization is now taking place using hog fuel and natural gas burners to heat steam or hot water systems. Sawdust hydroponics growing is proving to be a trouble free system of producing tomatoes. The high cost of production, not the lack of markets, appears to be the major constraint limiting increased expansion of greenhouse production of cucumbers and tomatoes.

For additional information, the B.C. Ministry of Agriculture and Foods have specialists who work with the commercial horticulture producers.

HORTICULTURE BUDGET

Financial structure and budget for a 55 acre vegetable farm.

CAPITAL REQUIREMENTS

land and buildings	$220,000	
machinery & equipment	100,850	
		$320,850

INCOME

cabbage	5 acres	$ 9,950	
broccoli	5 acres	13,500	
cauliflower	4 acres	8,500	
potatoes	25 acres	51,000	
rutabagas	5 acres	25,200	
parsnips	1 acre	5,600	
carrots	5 acres	18,000	
			$131,750

EXPENSES

production	$ 69,100	
fixed cash	13,700	
		82,800

MARGIN $48,950

To cover: depreciation, interest on term loans, operator labour, return to owner's equity, and a reserve for growth and development.

The detailed case study is available from the District Agriculturist in Prince George.

HONEY PRODUCTION

Production of honey has declined in recent years where it is now only a very modest industry in this area. In 1982 there were 161 producers, but only 3 to 4 had more than 100 colonies while most had between 1 and 3. The larger producers usually locate their colonies in the Vanderhoof or Peace River areas where production is much better.

The main reasons for the lack of interest in honey production is the poor yield, often as low as 40 pounds per hive. It is not entirely understood why production is so low but it can be partially attributed to the cooler cloudy weather conditions. In addition it is thought that due to the early harvest of the clover crops for feed, there is insufficient time for the collection of honey. This can be contrasted to the Peace River area where the clovers are often left in full bloom for extended periods to facilitate seed production.

Additional production information is available through the office of the District Agriculturist.

SERVICES PROVIDED BY BCMAF

The B.C. Ministry of Agriculture and Food was established to provide a stimulus for growth, and education for the advancement of agriculture in British Columbia. The Ministry has improved its services available as the industry has grown. Regional extension services are an integral part of the Ministry's field operations. Together with production and specialist services they form the nucleus of the Ministry's professional farm advisory services.

The primary goals of regional extension services are: to improve production and farm business management practices of producers in all commodities; to facilitate the transfer of new technology to farmers; to advise farm managers on the establishment of efficient and profitable farms; to encourage production and marketing practices that result in high quality agricultural products.

The programs are administered by local agriculturalists and horticulturists, and include farm business management, livestock and crop production programs, soil, feed and tissue testing services, land development assistance, and 4-H Club work. Some of the services that may be needed by farmers of this region include the following:

Engineering Branch

The engineering services provided include land drainage, farm building plans, waste management and farm mechanization. The services of an agricultural engineer can be made available through the District Agriculturist.

Dairy Branch

The dairy branch is involved in all aspects of the dairy industry, with emphasis on regulation, extension, and marketing. The Prince George region has a dairy specialist who provides these services.

Economics Branch

The economics branch is responsible for the farm business management, production economics, data processing and agriculture statistics. This branch provides instruction in financial management, estate planning, farm business planning, and farm records. Specialists are available by contacting the District Agriculturist.

Livestock Branch

The livestock branch provides specialist services to livestock producers and is designed to improve the quality and efficiency of livestock.

There are specialists in each commodity section including beef, sheep, swine and dairy. The branch also offers some assistance including computerized record of performance programs.

Soils Branch

The soils branch provides a service to farmers and ranchers in soil management and conservation. It is also responsible for the operations of the soil, feed, and tissue testing laboratory. Services can be provided on request through the District Agriculturist.

Veterinary Branch

This branch provides veterinary diagnostic services through the laboratory at Abbotsford. These services help the field investigator or private veterinary practitioner establish a final diagnosis.

Field and Special Crops Branch

The field and special crops branch staff provides specialist services to farmers and other staff members of the Ministry. The function of the branch is primarily extension but applied research is also carried out in co-operation with the Research Branch of Agriculture Canada and the University of B.C. Specialists are available to discuss crops, seed production, hay and silage, cropping management, weed and insect control and range management. Urban horticulture, nursery and greenhouse specialists are also available upon request.

Other Services

There are other branches and services provided by the Ministry including: funding for range improvement programs; information and regulatory services to the honey industry; crop insurance programs for grains, tree fruits, berries, forages and vegetables; crop protection specialists in areas of pathology, entomology and pesticides; demonstration projects of agricultural technology; poultry specialists; Agriculture Land Commission; 4-H program for the youth of B.C.; and, administration of the Farmer's Institute Act.

GOVERNMENT FINANCIAL ASSISTANCE PROGRAMS

B.C. Government Farm Income Insurance

This program is designed to assist farmers in offsetting the risk involved in the operation of a farming enterprise. The gross indemnity is 75% of the difference between the cost of production as determined by a formula and the net market return for the product. The cost of production is calculated which considers production of a product at a level achieved by the top 20% of producers.

The program is jointly funded by both the producer and the BCMAF. The maximum degree of participation in the program is determined by the size of the farm operation. As the farm operation becomes larger the percentage of losses eligible is reduced.

The products that are presently covered by the insurance program include: beef, blueberries, greenhouse tomatoes and cucumbers, broiler hatching eggs, sheep, swine, processing strawberries, fruit trees, processing vegetables, and potatoes. Further information on this program can be obtained from the BCMAF.

FARM ACCOUNTING

The most important task of the farm manager is to make decisions and carry them out. Decisions must be made about current operations, future plans, and choices betwen one or more alternatives. The basic tool for farm business decision making is a set of farm production records and accounts. They provide a means for assessing past performance and identifying business problems.

The actual recording of financial transactions and physical information is known as "bookkeeping". There are various forms and methods of bookkeeping including a hand completed ledger and ranging to a computerized system utilizing a commercial business or on-farm computers.

Many credit institutions now require annual or semi-annual budgets for the farming operation.

Budgeting is simply the planning stage of farming. Budgets can be used to calculate the repayment capacity of all or part of a farming operation to determine the amount of credit it is capable of handling. Budgeting will provide a guide to determine what income is needed to provide the following:

1. Pay all cash operation expenses;
2. Provide for depreciation of equipment;
3. Provide a fair return on investment;
4. Provide a wage to the farmer and farm family and for management.

A complete set of records is absolutely necessary in order to provide a means for budgeting and for cash flow projections. For further information contact the BCMAF.

FARM FINANCING AND CREDIT

Credit is a vital asset to farmers. It takes money to make money and credit is frequently the starting point. Proper use of credit will often enable a farmer to increase his income as much as, or more than, it could be increased by working extra hours. Experience has shown that the farmer's ability to manage finances is as important in a modern farm business as the ability to efficiently produce crops and livestock for market. Safe financial arrangements that will improve farm income are difficult to appraise. Therefore, the conclusion to use or not to use credit is one of the most important management decisions a farmer makes.

Plan a Credit Program

A farmer should consider the three R's of wise credit use before he decides to borrow money: RETURNS, REPAYMENT CAPACITY and RISK. The importance of considering all factors before borrowing money will help the farmer find answers to such critical questions as when to borrow, how much to borrow, what to borrow for, length of loan and repayment schedule, and what to use for security. The suppliers of credit for major loans require answers to all of these questions and demand that applications for credit be accompanied by summary statements for judging the past performance of the business and for projecting the expected results if the loan is granted.

Good farm managers use credit for investments which have the potential to repay more than the loan plus the interest. Their repayment contracts are for periods long enough to allow expected income from the new capital to repay the loan. Loans for current operating expenses are usually on a short term, one year repayment schedule. Intermediate-term loans are used for purchases of machinery, breeding stock, farm improvements, or soil conservation measures and may extend over a five to ten year period. Long-term loans are usually secured by a mortgage and are used for purchase of land, permanent additions, or major improvements to buildings and also for consolidation of existing debt if the business must be refinanced in order to remain solvent.

One of the marks of a good farm manager is to know where to obtain credit when it is needed. He should shop around for credit with the same care that he does when purchasing a new tractor or a purebred bull.

Steps in Preparing a Credit Proposal

1. Assess the alternatives:

   - Use borrowed funds in the most profitable way.
   - Use the partial budget for a quick assessment of the profitability of minor changes in the farm business.

2. Write down exactly what the money will be used for. Provide the lender with a clear concise, short explanation for the proposal.

3. Document your present position:

   - Prepare a net worth statement, outlining assets, liabilities and the amount of the equity which you have in the business. A Net Worth Statement tells the lender: type of assets and liabilities, amount of security, and the financial strengths of the business.

4. Document your income potential:

   - From last year's Income Statement, prepare an Income and Expense Budget for one or two years in the future.

5. Assess your cash position for the coming years:

   - This is shown in the Cash Flow Statement.
   - Outline the need for operating capital.

6. Discuss the proposal with your lender:

   - Be business-like.
   - Be prepared (do your homework).
   - Develop his confidence by being confident.

AGRICULTURE CREDIT SOURCES

The following is a list of the credit sources available to the agriculture industry with a brief description of purpose and eligibility. For more information direct contact will have to be made with the appropriate agency.

Commercial Banks and Credit Unions

These agencies provide short, intermediate and long term loans for operating purposes, capital purchases and personal needs. The amount of the loan is variable depending on purpose circumstance. Rates and repayment terms vary. Presenting a net worth statement, an operating statement and a cash flow budget would be a help in your application for a loan.

Agriculture Land Development Act

This program can be used for primary land development such as clearing, breaking and drainage, farm wells and irrigation. The maximum currently available is $25,000, with interest at approximately half of the prime rate established by the chartered banks, for a term not exceeding 15 years. Contact is through the BCMAF.

British Columbia Agriculture Credit Act

This Act facilitates the granting of credit to farmers who would be considered high risk by regular lending institutions due to their age, experience, or the nature of the enterprise. At this time the Act is used to provide partial guarantees as a form of security. In addition the Act allows for interest reimbursement for rates in excess of the rate specified each year. Contact is through the lending institutions.

Farm Credit Corporation

This Federal Government Act provides for long term mortgage loans for the purchase of land, buildings, equipment and livestock up to a maximum of $200,000 per applicant, or $500,000 per farm operation. Applicants must be principally involved in farming. Other types of loans available through the Farm Credit Corporation are Loans for Young and Beginning Farmers, and Farm Syndicate Loans.

A section of the Act allows loans to farmers under the age of 35 to phase into farming while maintaining outside income sources, provided the principal occupation of the applicant is farming within 5 years.

Another section of the Act allows for loans to groups of farmers to jointly purchase agriculture machinery or other assets. Loans under this plan are granted to a lesser of (1) $100,000.00 or (2) $15,000.00 per farm syndicate member, or (3) 80% of the cost of the equipment.

The syndicate must consist of three or more farmers willing to agree on certain responsibilities and benefits. The term for these loans range from 7 to 15 years, depending on the type of asset. Contact the local office of the Farm Credit Corporation for further information on any of these types of loans.

Farm Credit Corporation
204 - 715 Victoria
Prince George, B.C. V2L 2K5
Phone: 563-6223

Farm Improvement Loans

The Farm Improvement Loans Act of the Federal Government provides for a guarantee of loans borrowed from the regular lending institutions. The loans can be used for the purchase of land, buildings, machinery or livestock, or projects to improve or develop the existing farm operation. The interest rate will be 1% above the prime rate of the chartered bank. The loans may be to a maximum of $100,000.00 and have a term of 15 years. The applicant must be principally involved in farming, and must provide a reasonable portion of the purchase price out of his own resources. Further information can be obtained from the lending institutions.

Federal Business Development Bank

The Bank provides intermediate and long-term loans to farmers who do not qualify under other Federal or Provincial loan policies. The amount of the loan is variable. The interest rates are set according to prescribed government policy, and can be fixed on a floating rate, at the option of the farmer. Payments are generally monthly, and are not amortized. For more information contact the local office of the Federal Development Bank.

References: See Sources of Farm Credit in British Columbia
BCMAF, May, 1984.

INCOME TAX OPPORTUNITIES

The Canadian Income Tax Act recognizes the significance of the agricultural industry and some of the unique problems facing its members and provides special rules for the calculation of income, special averaging provisions, special rules for the tax deferred transfer of family farming corporations and special fast write-offs not available to other sectors.

Income Calculation

Under the Act farmers are allowed to calculate their income on the "cash basis" which permits them to recognize income as funds are received. Recognition is given to the fluctuating nature of farming income by providing for an additional income of up to the fair market value of any livestock inventory on hand at year end. Costs incurred in the clearing, levelling and drainage of land are specifically allowed as a deduction in calculating income from farming.

Fast Write Offs

Farmers are permitted to depreciate any wooden buildings used in the farming operation at a 10% declining balance, as opposed to a 5% declining balance that is available in any other industry.

Averaging

Farmers are permitted to block average under Section 119 of the Canadian Income Tax Act. This averaging is available to anyone whose primary source of income, in five years out of the preceding six years, has been farming. Averaging results is smoothing the incomes in order to mitigate the effects of our progressive personal taxation rates.

Farm Family Transfers

Perhaps the greatest advantage provided to the farmer under the Income Tax Act is the ability to transfer, on a tax deferred basis, his farm property to his children. Provided the transfer takes place at or below the adjusted cost base of the farm property, no tax need be paid by the farmer.

Summary

The complexity of farming and the Income Tax Act is beyond the scope of this publication. Those seriously contemplating entering into the farming industry should obtain professional advice for a full review of the provisions as they may affect them. Information is available from the District Agriculturist.

CONTRIBUTORS TO THIS HANDBOOK

G.L. Elgie, District Agriculturist

J.N. Tingle, Field Crop Specialist

G.S. Emmond, Horticulturist

A.J. Ford, Regional Farm Economist

R.O. Kline, Soil Specialist

H. Gorbahn, Dairy Specialist

Co-ordinating Author: J.A. Collins
Consulting Agrologist

RECOMMENDED READING MATERIAL/REFERENCES

PUBLICATIONS AVAILABLE

Publication Number	Name
1635 CDA	Growing Degree-Days & Crop Production in Canada
1658/E CDA	Farm Pasture Fencing BCMAF & U.B.C. Updates
1670/E CDA	Feeding Beef Cows and Heifers
1521/E CDA	Farming Acid Soils in Alberta & NE B.C.
Alberta Agdex 534-1	Liming Acid Soils
Alberta Agdex 534-2	Crop Yields & Economics of Liming Acid Soils
736-11 CDA	Natural Air Grain Drying & Aeration
BCMAF	Field Crop Guide to Weed, Insect & Disease Control
1439 CDA	Dairy Husbandry in Canada
Alberta Agriculture	Alberta Sheepman's Manual
BCMAF	Soil Sampling
BCMAF	Forage Crop Recommendations for Central B.C.
BCMAF	Fertilizer Guide for Central B.C.
Interstate Printers & Publishers Inc., Danville, Illinois 61832	Western Fertilizer Handbook

Manitoba Agriculture	Hay & Forage Harvesting Methods, O.H. Friesen, P. Eng.
University of Manitoba	Principles & Practices of Commercial Farming
BCMAF - 1979	Feeding and Management Guide for Growing Beef Cattle
BCMAF - 1982	B.C. Agriculture Service Guide

B.C. Ministry of Agriculture & Food Office, Experimental Farm Site, RR#8, RMD#7, Prince George, B.C., V2N 4M6: Ph. 963-9685.

POOR
QUALITY
ORIGINAL